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**REMARKS**

This Election is responsive to the written Restriction Requirement dated February 10, 2005.

**Claims 50-53 are treated as previously presented**

It is Applicants' understanding that the original Response was entered. Accordingly, claims 50-53, which were new claims in the original Response, are indicated herein as "previously presented".

**The Restriction Requirement**

The Restriction Requirement dated Feb. 10, 2005 calls for election of one of:

Group I      Apparatus claims 18-42; and

Group II     Method claims 1-17 and 43-49.

Additionally, the Restriction Requirement further calls for election of one of:

Species A    FIGURES 1-4, 5A, 5B, 6, and 6A;

Species B    FIGURE 7;

Species C    FIGURE 9;

Species D    FIGURE 10;

Species E    FIGURE 11;

Species F    FIGURE 12; and

Species G    FIGURE 14.

**Applicants elect Apparatus Group I**

Applicants elect apparatus claims 18-27 and 30-42 for examination on the merits. Applicants have further canceled apparatus claims 28 and 29, and have added new apparatus claims 50-53 which separately claim the elements of the Markush groups of canceled claims 28 and 29. As apparatus claims 28 and 29 fall within Group I, apparatus claims 50-53 therefore also fall within Group I, and are also elected for examination on the merits.

Applicants cancel herein method claims 1-17 and 43-49; however, Applicants reserve the right to prosecute these method claims in a subsequent continuation, continuation-in-part, or divisional application.

**Applicants elect Species B, FIGURE 7**

Applicants elect Species B, FIGURE 7 for examination on the merits.

Claims 18-20, 23, 25-26, 31-35, 40-42, and 50-53 are readable upon Species B, FIGURE 7.

As noted in the Restriction Requirement at page 3, "[u]pon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR [§] 1.141." Accordingly, upon allowance of a corresponding base claim, Applicants respectfully request consideration and allowance of unelected dependent apparatus claims 21, 22, 24, 27, 30, and 36-39 depending therefrom.

Although claims consonant with Species B have been elected, it is noted that the scopes of elected apparatus claims 18-20, 23, 25-26, 31-35, 40-42, and 50-53 are not limited to the elected embodiment, but should be given their broadest reasonable interpretation consistent with the specification, in accordance with 37 CFR § 2111.

**Further Comment on the Species Election**

This revised Election Response is submitted responsive to an oral communication initiated by Examiner Tran on May 10, 2005, requesting clarification as to the election of claims 20, 27, 31, 32, 34, 35, 40-42, and 50-53 as being consonant with elected Species B.

In response, Applicants have reviewed the claims previously deemed consonant with elected Species B in Applicants original Response filed on March 9, 2005. Based upon this review, claim 27 is now re-classified herein as not reading upon elected Species B. However, the remaining claims 20, 31, 32, 34, 35, 40-42, and 50-53 are believed to read upon elected Species B of FIGURE 7.

**Claim 20** reads upon Species B, in part because the second mirror sub-stack 126 is a Bragg reflector:

[0094] With reference to FIGURE 7, one of the resonant cavity light emitting devices 108 of FIGURE 6A is described in greater detail. In this exemplary device, the stack of group III-nitride layers 112 grown on the gallium nitride substrate 106 includes ... a second mirror

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sub-stack 126 defining a p-type AlInGaN distributed Bragg reflector (DBR).

Regarding the remaining claims in question, elected Species B includes the substrate 106. Accordingly, characteristics of substrate 106 are inherently incorporated into the resonant cavity light emitting device 108 illustrated in Fig. 7 corresponding to elected Species B. Some such characteristics are of a nature not amenable to illustration (such as chemical composition, optical characteristics, dislocation densities, and so forth), but are to be understood as being characteristics of the substrate 106 as described in the original specification. It is further noted that substrate 106 is merely an example wafer cut from the gallium nitride boule 12. See, for example, paragraph [0086] of the specification:

[0086] With reference to FIGURES 6 and 6A, the superheated fluid-mediated recrystallization grown gallium nitride boule 12 is preferably sliced (as indicated in FIGURE 6 by dashed slice cut lines 104) to produce a plurality of gallium nitride wafers such as exemplary gallium nitride wafer 106. ...

The substrate 106 inherently incorporates characteristics as the source boule 12 from which it was cut, such as resistivity, chemical composition, and optical characteristics.

Claims 31, 35, and 42 call for the substrate to have specified dislocation density limits. The illustrated substrate 106 is described in the original specification as having these dislocation density limits at least at:

[0093] ...Thus, for example, the gallium nitride substrate 106 preferably has a dislocation density of less than  $10^4 \text{ cm}^{-2}$ , and more preferably has a dislocation density of less than  $10^3 \text{ cm}^{-2}$ , and still more preferably has a dislocation density of less than  $100 \text{ cm}^{-2}$ ; ...

Claims 31, 35, and 42 call for the substrate to be substantially free of tilt-boundaries. The illustrated substrate 106 is described in the original specification as having this characteristic at least at:

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[0095] ...the single-crystal gallium nitride substrate 106 is substantially free of tilt boundaries...

Claims 32 and 40 call for the substrate to have specified optical absorption characteristics. The illustrated substrate 106 is described in the original specification as having these optical absorption characteristic at least at:

[0080] ...In contrast to gallium nitride grown by other methods such as hydride vapor phase epitaxy, the gallium nitride grown by the superheated fluid-mediated recrystallization growth process had several sharp absorption peaks in the range of 3050 to 3300  $\text{cm}^{-1}$ , with a maximum absorption near 3175  $\text{cm}^{-1}$ . The crystal was annealed to 750 °C in high purity nitrogen for 30 min and the infrared spectrum was re-measured. The absorption peaks in the range of 3050 to 3300  $\text{cm}^{-1}$  were substantially unchanged, indicating a high stability of these species....

[0083] Within the visible spectrum, the gallium nitride boule 12 typically exhibits substantial transparency. The optical absorption coefficient for nominally undoped crystals is generally less than 5  $\text{cm}^{-1}$  between 465 nm and 700 nm....

Again, it is noted that the substrate 106 is cut from the boule 12, and thus the substrate 106 inherently has the optical absorption coefficient of the boule 12.

Claim 34 calls for the substrate to have a resistivity less than 10 ohm-cm. The illustrated substrate 106 is described in the original specification as having this characteristic at least at:

[0119] The exemplary resonant cavity light emitting devices 108, ... have a p-on-n configuration: that is, the n-type material is adjacent the gallium nitride substrate 106, 106' while the p-type material is distal from the gallium nitride substrate 106, 106'. For backside electrical

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contact, the gallium nitride substrate should be conductive, doped n-type by including a suitable dopant source in the capsule 10 such as a silicon or oxygen precursor. The doping preferably produces a substrate resistivity of less than 10 ohm-cm, and more preferably of less than 1 ohm-cm. For devices employing frontside contacts, the gallium nitride substrate can be n-type, undoped, or p-type, but is preferably n-type with electrical resistivity less than about 10 ohm-cm.

...

**Claim 41** calls for the substrate to have a fluorine concentration greater than about 0.04 ppm. The illustrated substrate 106 is described in the original specification as having this characteristic at least at:

[0085] In the case where gallium nitride boule 12 is grown using at least one of  $\text{NH}_4\text{F}$ ,  $\text{GaF}_3$ , or other compounds obtainable by reaction of Ga, GaN,  $\text{NH}_3$ , and HF, as mineralizer, a preferred embodiment, the gallium nitride typically contains greater than about 0.04 ppm fluorine, and typically between about 0.04 and 1 ppm fluorine. By contrast, GaN crystals grown with fluorine-free mineralizers typically contain less than 0.02 ppm fluorine. ...

**Claims 50-53** call for the stack of group III-nitride layers to have specified principal surface orientations. These orientations are described in the original specification as having this characteristic at least at:

[0093] ...the stack of group III-nitride layers has a principal surface with an orientation corresponding to epitaxy surface orientation of the substrate, which is suitably selected from a group consisting of: (0001), (000 $\bar{1}$ ), (1 $\bar{1}$ 00), and (11 $\bar{2}$ 0).

It is pointed out that the text of paragraph [0093] is describing the devices 108 illustrated in FIGURE 6A formed on the substrate 106. Devices 108 is the elected species; FIGURE 7 merely shows a cross-sectional view of one of the devices 108.

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**Information Disclosure Statements**

Applicants submitted an Information Disclosure Statement filed with the application, and further submitted a Supplemental Information Disclosure Statement on Feb. 16, 2004. Applicants respectfully request an indication of receipt of these Information Disclosure Statements and of consideration of the corresponding references in the forthcoming first Office Action on the merits.

**CONCLUSION**

Based on the foregoing, it is submitted that claims 18-20, 23, 25-26, 31-35, 40-42, and 50-53 as set forth herein are suitably examined together. Accordingly, Applicants ask for entry of the amendments, and look forward to substantive examination of claims 18-20, 23, 25-26, 31-35, 40-42, and 50-53 as set forth herein.

Respectfully submitted,

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